



AOCC Quick Reference Guide

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Contents

Chapter 1: AMD EPYC 9xx5-Series Processors Compiler Options Quick Reference.....	3
1.1 AOCC compiler (C/C++/Fortran).....	3
1.2 AMD Optimized Libraries.....	4
1.3 AMD uProf (Performance & Power Profiler).....	4
1.4 GNU Compiler Collection.....	4
1.5 Microsoft® Visual Studio 2022.....	6
1.6 Glibc.....	7
1.7 Binutils.....	7
1.8 Intel® oneAPI DPC++/C++ Compiler.....	7
Appendix A: Additional Resources and Legal Notices.....	9
A.1 Revision History.....	9
A.2 Notices.....	9
A.2.1 Trademarks.....	9

Chapter 1: AMD EPYC 9xx5-Series Processors Compiler Options Quick Reference

1.1 AOCC compiler (C/C++/Fortran)

Latest release: 5.0, October 2024

<https://www.amd.com/en/developer/aocc.html>

Action	Command
Architecture	
Generate instructions that runs on AMD 5 th Gen EPYC™ and AMD 5 th Gen Ryzen™	<code>-march=znver5</code>
Generate instructions supported in the given machine	<code>-march=native</code>
Optimization Levels	
Disables all optimizations	<code>-O0</code>
Enables minimal level optimizations	<code>-O1</code>
Enables moderate level optimizations (Default from AOCC 4.1)	<code>-O2/-O</code>
Enables all optimizations that attempt to make programs run faster	<code>-O3</code>
Enables O3 with other aggressive optimizations that may violate strict compliance and precisions	<code>-Ofast</code>
Enables link time optimization	<code>-flto</code>
Enables advanced optimizations - improved variants of various scalar, vector, and loop transformations	<code>-zopt</code>
Enables advanced vector transformations	<code>-fvector-transform -mllvm -enable-strided-vectorization</code>
Enables loop transformations	<code>-floopt-transform</code>
Enables advanced loop transformations	<code>-faggressive-loop-transform</code>
Enables memory layout optimizations	<code>-flto -fremap-arrays -mllvm -reduce-array-computations=3</code>

Action	Command
Enables function level optimizations	<code>-flto -fitodcalls</code> <code>-mllvm -function-specialize</code> <code>-flto -finline-recursion={1..4}</code>
Profile guided optimizations	<code>-fprofile-instr-generate</code> (1st invocation) <code>-fprofile-instr-use</code> (2nd invocation)
Enables use of OpenMP® directives	<code>-fopenmp</code>
Enables streaming stores to optimize memory bandwidth usage	<code>-fnt-store</code>
Other Options	
Enables faster, less precise math operations (part of Ofast)	<code>-ffast-math</code> <code>-freciprocal-math</code>
OpenMP® threads and affinity (N number of cores)	<code>export OMP_NUM_THREADS=N</code> <code>export GOMP_CPU_AFFINITY="0-{N-1}"</code>
Link to AMD library	<code>-L/libm-install-dir/lib -lamdlibm -lm</code>
Enables vector library	<code>-fveclib=AMDLIBM -lamdlibm -lm</code>
Enables faster library	<code>-Ofast -ffastlib=AMDLIBM -lamdlibmfast -lamdlibm -lm</code>
For Fortran Workloads	
Compiles Fortran free form layout	<code>-ffree-form</code>

1.2 AMD Optimized Libraries

Latest release: 5.0, October 2024

<https://www.amd.com/en/developer/aocl.html>

1.3 AMD uProf (Performance & Power Profiler)

Latest release: 5.0, October 2024

1.4 GNU Compiler Collection

<https://www.amd.com/en/developer/uprof.html>

Latest release: GCC 14.2, July 2024

Recommended version: GCC 14.1 or later

<http://gcc.gnu.org>

Action	Command
Architecture	
Generate instructions that runs on AMD 5 th Gen EPYC™ and AMD 5 th Gen Ryzen™	-march=znver5
Generate instructions supported in the given machine	-march=native
Optimization Levels	
Disables all optimizations (default)	-O0
Enables minimal level optimizations	-O1/ -O
Enables moderate level optimizations	-O2
Enables all optimizations that attempt to make programs run faster	-O3
Enables O3 with other aggressive optimizations that may violate strict compliance and precisions	-Ofast
Additional Optimizations	
Enables link time optimizations	-flto
Enables unrolling	-funroll-all-loops
Generates memory preload instructions	-fprefetch-loop-arrays
Enables profile-guided optimizations	-fprofile-generate (1 st invocation) -fprofile-use (2 nd invocation)
Enables use of OpenMP® directives	-fopenmp
Other Options	
Enables compiler to use IEEE FP comparisons	-mieee-fp
Enables faster, less precise math operations	-ffast-math
Compiles Fortran free form layout	-ffree-form
OpenMP® threads and affinity (N number of cores)	export OMP_NUM_THREADS=N export GOMP_CPU_AFFINITY="0-{N-1}"

Action	Command
Link to AMD library	<code>-L/libm-install-dir/lib -lamdlibm -lm</code>

1.5 Microsoft® Visual Studio 2022

Latest release: 17.11.4, September 2024

<https://visualstudio.microsoft.com/>

[User Guide](#)

Action	Command
Architecture	
Generate instructions that run on AMD 5 th Gen EPYC™ and AMD 5 th Gen Ryzen™	<code>/arch:[AVX AVX2 AVX512]</code>
Optimize for 64-bit AMD processors	<code>/favor:AMD64</code>
Optimization Levels	
Disable optimizations	<code>/Od</code>
Maximum optimizations (favor space)	<code>/O1</code> includes <code>/Ob2</code>
Maximum optimizations (favor speed)	<code>/O2</code> includes <code>/Ob2</code>
Enables inline expansion	<code>/Ob</code> (0/1/2/3)
[link.exe] Eliminates unreferenced function and/or data	<code>/OPT:REF</code>
[link.exe] Performs identical COMDAT folding	<code>/OPT:ICF</code>
Output an informational message for loops that are auto-vectorized	<code>/Qvec-report:[1 2]</code>
Enables automatic parallelization of loops, used with <code>#pragma loop()</code> directive	<code>/Qpar</code>
Output an informational message for loops that are auto-parallelized	<code>/Qpar-report:[1 2]</code>

Action	Command
Additional Optimizations	
Maintain the precision for floating-point operations through proper rounding	/fp:precise
Optimize floating-point code for speed at the expense of floating point accuracy and correctness	/fp:fast
Whole Program Optimization (link-time code generation)	/GL
Enables Profile-guided optimizations	/LTCG /GENPROFILE (1 st invocation) /LTCG /USERPROFILE (2 nd invocation)
Enables OpenMP® Support	/openmp:experimental /openmp:llvm

1.6 Glibc

Latest release: 2.40, July 2024

Recommendation: 2.38 or later

<https://www.gnu.org/software/libc/>

1.7 Binutils

Latest release: 2.43, August 2024

Recommendation: 2.42 or later

<https://www.gnu.org/software/binutils/>

1.8 Intel® oneAPI DPC++/C++ Compiler

Latest release: 2024.2.1

<http://software.intel.com>

Action	Command
Architecture	

Action	Command
Generate instructions that run on AMD 5 th Gen EPYC™ and AMD 5 th Gen Ryzen™	-axCORE-AVX512
Optimization Levels	
Disable all optimizations	-O0
Speed optimization without code growth	-O1
Enables optimization for speed including vectorization	-O2
Enables O2 and aggressive loop transformations	-O3
Enables set of aggressive options to improve speed	-Ofast
Additional Optimizations	
Sets function inline level	-inline-level=<value>
Sets maximum number of times to unroll loops	-unroll[=n]
Disable improved precision floating divides	-no-prec-div
Enables vectorization	-vec
Enables inter procedural optimizations (alias for -flto)	-ipo
Enables whole program link time optimization (LTO)	-flto[=arg]; arg: full (default), thin
Enables use of OpenMP® directives	-qopenmp
Enables profile generated optimization	-prof-gen and -prof-use
Other Options	
Enables floating point accuracy tunings	-fp-model
Compiles Fortran free form layout	-free

Appendix A: Additional Resources and Legal Notices

A.1 Revision History

Date	Revision	Description
October 2024	5.0	Created this document for the 5.0 release.

A.2 Notices

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